CLAIMS

1. An apparatus for the determination of a condition or state of an object based on quasi-elastic interaction between the object and light transmitted to the object, comprising:

a diffractive optical element being adapted to be illuminated by a incoming light beam, the diffractive optical element comprising a diffracting region defining a diffraction plane, the incoming light beam forming an angle of incidence to a normal of the diffraction plane, the diffracting region comprising

- a first diffracting structure for diffraction and focussing of a first light beam to the object, and
- a second diffracting structure that is laterally displaced relative to the first diffracting structure for diffraction and focussing of a second light beam to the object, the first and the second light beam being diffracted at a first diffraction angle to a normal of the diffraction plane,

the first and second diffracting structures focussing the first and second light beams in the same focussing plane, said focussing plane being substantially perpendicular to propagation directions of the first and second light beams,

the diffracting region further comprising

- a receiving diffracting structure for diffraction of light from the light beams that has interacted with the object, the diffracted light being diffracted in a second diffraction angle to the normal of the diffraction plane,

wherein the size of the angle of incidence of the incoming light beam and the second diffraction angle are substantially equal.

2. An apparatus according to claim 1, further comprising

- a receiver for collecting and detecting light diffracted from the receiving diffracting structure, and
- a processor operatively connected to the receiver for determining the condition or state of the object based on the detected light.

3. An apparatus according to claim 1, wherein the diffracting region comprises additional diffracting structures for diffracting additional light beams to the object,

each of the additional light beams being diffracted at the first diffraction angle to a normal of the diffraction plane.

4. An apparatus according to claim 3, wherein the additional light beams are focused in the same focussing plane as the first and second light beams.

5. An apparatus according to claim 1, further comprising a light source for emission of the incoming light beam.

6. An apparatus according to claim 5, further comprising means for collimating the emitted light beam.

7. An apparatus according to claim 5, wherein the light source emits light between 400 and 10600 nm.

8. An apparatus according to claim 5, wherein the light source is a substantially monochromatic light source.

9. An apparatus according to claim 8, wherein the light source is a laser.

10. An apparatus according to claim 8, wherein the light source is a laser diode.

11. An apparatus according to claim 2, wherein the detector comprises a first and a second light sensitive area.

12. An apparatus according to claim 11, further comprising spatial filters positioned in front of the light sensitive areas of the detector.

13. An apparatus according to claim 12, wherein the spatial filters positioned in front of the light sensitive areas are pinholes.

14. An apparatus according to claim 12, wherein the spatial filters positioned in front of the light sensitive areas comprises two optical fibers connected to the light sensitive areas of the detector.

15. An apparatus according to claim 3, wherein the detector comprises a single light sensitive area.

16. An apparatus according to claim 15, further comprising a spatial filter positioned in front of the light sensitive area of the detector.

17. A flow sensor for measuring flow velocity of a fluid, the flow sensor comprising an apparatus according to claim 1.

18. A flow sensor according to claim 17, wherein the fluid is a gas.

19. A flow sensor according to claim 17, wherein the fluid is a liquid.

20. A velocity sensor for measuring a surface velocity of an object, the velocity sensor comprising an apparatus according to claim 1.

21. A method for the determination of a condition or state of an object based on quasi-elastic interaction between the object and light transmitted to the object, the method comprising the step of:

providing a diffractive optical element and illuminating said diffractive optical element by a incoming light beam, the diffractive optical element comprising a diffracting region defining a diffraction plane, the incoming light beam forming an angle of incidence to a normal of the diffraction plane, the diffracting region comprising

- a first diffracting structure for diffraction and focussing of a first light beam to the object, and
- a second diffracting structure that is laterally displaced relative to the first diffracting structure for diffraction and focussing of a second light beam to the object, the first and the second light beam being diffracted at a first diffraction angle to a normal of the diffraction plane,

the first and second diffracting structures focussing the first and second light beams in the same focussing plane, said focussing plane being substantially perpendicular to propagation directions of the first and second light beams,

the diffracting region further comprising

- a receiving diffracting structure for diffraction of light from the light beams that has interacted with the object, the diffracted light being diffracted in a second diffraction angle to the normal of the diffraction plane,

wherein the size of the angle of incidence of the incoming light beam and the second diffraction angle are substantially equal.